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Invited Perspective - Nutritional Needs and Implications for Children in Subsistence Marketplaces

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Nutritional Needs and Implications for Children in Subsistence Marketplaces

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Introduction

Today, while the number of stunted children is decreasing in all geographies, the progress is not consistent. Moreover, there is an increasing prevalence of overweight and obesity among children and adolescents. Globally, about half of all children under five do not receive essential nutrients, often unnoticed until too late. On the other end of the spectrum, the incidence of overweight and obesity in 5–19-year-olds has increased from 4% in 1975 to 18% in 2016.[1] These trends reflect a *triple burden of malnutrition*, a burden that impacts the survival, growth, and development of children, and in turn, economies, and communities. This is a major risk factor of mortality and negatively impacts physical, cognitive, performance and productivity in the subsistence geographies.[2]

Low income in subsistence marketplaces is compounded by low literacy rates, which, in turn, affect the decision-making process in food acquisition and nourishing the families. Individuals, households, and communities in these markets are often not aware that they even have a need—that the children are nutritionally deficient and the problems it can cause later in life. They may not be aware of the nutritional options that are available and affordable to deal with this deficiency.

This paper is intended to highlight nutritional concerns of subsistence marketplaces, discuss a few case studies with successful interventions, and provide suggestions for research and practice.

Nutrition-Related Overview of Subsistence Marketplaces

Nutritional Context:

One in three children are not growing well because of malnutrition. In many geographies, three forms of malnutrition, i.e., undernutrition, hidden hunger and overweight, tend to co-exist, even within a given household. This means that a single country may face the burden of addressing high rates of stunting (generally defined as low height-for-age), micronutrient deficiencies, as well as obesity. In 2020, globally, UNICEF estimates 149.2 million children under the age of 5 years of age were stunted, 45.4 million wasted, and 38.9 million overweight.

Malnutrition can cause permanent impact to a child's growth, development, and well-being. For example, stunting is associated with poorer performance in school. This is because malnutrition affects cognitive development and performance, and moreover, malnutrition and micronutrient deficiency impact immune function which may result in increased risk for sickness and missed school days. Hidden hunger or micronutrient deficiency can lead to blindness due to vitamin A deficiency, affect learning due to iodine deficiency) and increase chances of a mother's death when giving birth due to iron deficiency.[3] Overweight and obesity among adults can further lead to serious illnesses, such as type 2 diabetes and cardiovascular disease.[4]

It is estimated that 21.3% of children under 5 years of age globally are stunted, ranging from 34.5% in eastern Africa to 4.5% in eastern Asia as of 2019. Though there were ~109 million fewer children experiencing stunting in 2019 compared with 1990, the progress is inconsistent - stunting in the African region has increased by ~13.1 million since 1990, due to marked growth in population. Countries with the highest levels of stunting prevalence are concentrated in South and Southeast Asia and sub-Saharan Africa.

The impact of stunting/ malnutrition on anthropometric and cognitive development stays through into adulthood affecting their productivity and economic future. It undermines a country's ability to develop human capital, significantly impacting education, skills, and health among its people.

According to the UNICEF 2019[3] report, the economic impact of stunting is estimated in lifetime lost earnings of about USD 1,400 per child. This number is manifold higher in wealthier countries, although the incidence of stunting is lower. Health related economic costs of diseases arising from being overweight or obese, such as heart disease, and diabetes are estimated at US $7 trillion in low and middle income countries in the timeframe of 2011–2025. The impact globally of malnutrition has been estimated to be US $3.5 trillion annually, or US $500 per capita. The economic perspective in monetary terms does not capture the human impact on well-being.

The ongoing COVID-19 pandemic further exacerbated the risk of malnutrition due to the economic impact of social distancing, lockdowns, unemployment, etc.[5] In addition, due to school shutdowns, children who were on mid-day school meal programs for nourishment may have lost a significant source of nourishment over prolonged periods of time. Slower vaccination rates, vaccine inequality and new COVID variants will compound the economic losses in the respective countries and could further significantly impact nutritional status in developing geographies.

Consider the example of India: about 1/3 of children under 5 in India today are stunted, compared to 48% in 2014 and 66% that were stunted in 1990. This is attributed to the fact that the children receive neither an adequate diet, in terms of macronutrients and calories, nor an adequately diverse diet to ensure meeting the micronutrient requirements.[6,7] Insufficient dietary diversity resulting in micronutrient deficiency has been shown as yet another cause of undernutrition/ malnutrition in these communities.[8]

In the Indian context, the National Institute of Nutrition (NIN)'s National Nutrition Monitoring Bureau (NNMB)[9] collected data on the nutritional status of its citizens on an ongoing basis and periodically evaluates the data to help improve ongoing National Nutrition Programs. NNMB found that the rural population of India still does not receive the recommended daily allowance of diverse food groups, except roots and tubers, and that India is still deficient in a number of important nutrients, notably iron and riboflavin. Most of the rural population surveyed was protein deficient, and significantly calorie deficient. Children under three fared the worst. Although there is an improvement in stunting, nutritional deficiencies continue to persist.

This is often attributed to gaps in education and awareness of the nutritional needs of their children.[10] In addition, young mothers, typically occupied with other household tasks, do not find

the time or energy to adequately feed/ breast-feed their youngest children under 1000 days of age. Whereas older children do receive mid-day school nourishment, inability to adequately nourish during the first 1000 days of life is a missed opportunity in reducing the risk of malnutrition and stunting. Tribal populations in these geographies are in even worse straits than rural populations due to lack of availability of government funded and organized nutritional intervention programs. The few examined variables that seemed to alleviate malnutrition were relatively higher income, the presence of toilets, and literacy of the mother. Results have improved since the first survey in 1975-1976, with stunting and wasting among young children diminished by about half, but nutrient deficiencies persist.

Macro-Level Food Consumption Patterns

Populations in subsistence markets have lower income elasticity tolerance compared to the upper income quartile. Economic elasticity is assessed through the impact of income on expenditures by assessing how consumption changes with a 1% change in income. For the very poor, consumption of necessities rises with a dramatic increase in milk consumption, as milk is considered wholesome nutrition. For those in more disposable income quartiles, responses are more muted to the question of change in purchase behavior due to change in income.[11] With rising costs, studies have shown a decrease in calorie and protein intake across all income ranges in India[12] due probably to inflation in food prices- increases in the price of certain foods, notably cereals and vegetables.

The economic impact of subsistence communities on food patterns was studied in Delhi, India with randomly selected 20 low- and middle-income households representing a multicultural population, with household incomes between 5000 and 15,000 INR/ month (1 USD = 74 INR, Nov 5 2021). The study showed that a rise in food prices impacts the community's ability to buy and eat adequate food products. The largest share of the food money (22%) is spent on vegetables, with proteins, grains and cereals, milk and dairy products, and fats, nuts and seeds following closely behind at roughly 15%. The remaining funds are utilized to buy fruits, pulses, sugars, beverages, fast food, and salt. Food is a significant economic burden as low- and middle-income urban households in Delhi spend about 59% of their income on food. The study also found two-fold higher intake of sodium compared to WHO recommendation in these communities putting them at higher risk for noncommunicable diseases such as cardiovascular disease.[13] This finding is further corroborated by Mestral et al 2017.[14]

Micro-level Psychological, Social and Cultural Context

The subsistence marketplaces approach provides unique insights at the micro-level with a bottom-up approach. The insights below are derived from this stream of work (e.g., Viswanathan, 2013)[15] and my experience as a practitioner. The literature on subsistence marketplaces examines variables such as low literacy in concert with low income, and the impact on aspects such as thinking and feeling. Nutrition as a concept may itself be very abstract for subsistence consumers – equated more concretely with how people cook in a healthy way, such as through practices passed on, through medical advice, or intuitive knowledge, such as about fruits and vegetables. Nutrients similarly are abstract and difficult to grasp, eluding the visual

sensory mode and pictographic thinking. Similarly, causal inferences between concepts or variables in the realm of health and nutrition may be particularly challenging, given the complexity of the domain.[16] Nutritional products can be aspirational, indeed, life-aspirational, as parents dream of a better life for their children. This is reflected in willingness to pay a premium for nutrition even with limited resources, provided the value of the product can be demonstrated.

My own experience combined with my involvement with student-led projects on subsistence marketplaces at the University of Illinois, Urbana-Champaign (UIUC) have reinforced and supplemented these insights. The UIUC's College of Business interdisciplinary student teams developed and field tested several concepts understand acceptability and affordability. Some of the insights came from the development of convenient nutritional supplements for children, understanding of gestational nutritional issues, and identification of gaps in these markets.[10]

Several factors that define subsistence marketplaces impact malnutrition and stunting. For example, direct factors such as higher maternal education appears to have a 30% favorable impact on the nutritional and anthropometric outcomes during childhood. Similarly, household income, which is again related to maternal education, has an impact on malnutrition in children. Hygiene factors, such as unclean water, open defecation practices, and absence of toilets are strongly correlated with malnutrition and stunting. Hygiene factors have been shown to cause frequent gastrointestinal infections resulting in diarrhea and subsequent chronic malnutrition in these communities.[17]

Interventions and best practices

Typical nutritional interventions are designed to increase the dietary diversity through the supplementation of critical micronutrients such as iron, folic acid, zinc, vitamin A, vitamin C, the B vitamins, and calcium and are intended to decrease risk of mortality in infants and their mothers. Multiple studies across continents have demonstrated the impact of better nutrition in improved school attendance and performance in areas like mathematics and reading.[3] The cost of delivering optimum nutrition to eliminate stunting in children in several geographies is relatively small with an impressive rate of return. Every dollar invested in reducing stunting generates estimated economic returns equivalent to about US $18.[3]

Supplementation is deemed essential. Even if children achieve 100% of their energy intake from macronutrients such as carbohydrates, fats or proteins, they fail to get sufficient amounts of required micronutrients due to poverty and lack of access and affordability of diverse foods. Several technologies have emerged in recent years to make supplementations seamless through biofortification (e.g., iron, Vit A, folic acid, etc. in rice (PATH) or wheat or of iodine to salt.)[18]

Good food and nutrition are not only the foundation of children's health and the development of society at large. Nutritional interventions have been clearly demonstrated to be an effective approach for subsistence marketplaces in improving human capital and productivity in multiple geographies.[19] As an example, in India, a study conducted by UNICEF during 1999-2004 in Jharkhand, India, showed favorable outcomes when the population was given intensive counseling on prenatal care; on breastfeeding and hygiene practices in the first hours and days after birth; education on when to introduce complementary foods; on immunization, etc. The

study also demonstrated the efficacy of the involvement of the local childcare center (Anganwadi) worker who helped with education, as well as food preparation during household visits. The program resulted in a 45% reduction in severely malnourished children in Jharkhand. Noteworthy here is how the circumstances of impoverishment affected uptake of nutrition. Understanding at this granular level of individual and environmental constraints that people face can help improve the design of nutritional programs for specific circumstances. Yet each context is different, emphasizing the need for bottom-up understanding.

No one magic bullet exists to solve these complex problems. Successful interventions must include a combination of food supplements and education, and must act at the community/ grass root levels as well as the household and individual levels. Given women have a large influence on which foods are purchased or prepared, literacy and empowerment of women appears to be most critical in ensuring successful outcomes of these interventions.

The subsistence marketplaces approach is particularly well-suited in this regard in empowering families, children and young people to demand nutritious food. Increasing the demand for healthy foods is an important step towards increasing their supply, availability, and affordability. But creating this demand requires a cultural shift: one where a healthy diet is aspirational, where women have more household decision-making power, and families and children know more about making healthy food choices. This can be shaped through nutrition education at home, in schools, and through public communication campaigns, innovative and memorable communications that appeal to both parents and children, legislation proven to limit demand for unhealthy food, including sugar taxes, and encouragement of fathers and other family members to support women's roles as both earners and caregivers.

Considerations

Policies designed to address the nutritional crisis require multidisciplinary action with a strong framework to integrate programs such as literacy, women's empowerment and nutritional delivery. Lack of leadership and organization that are frequently associated with the subsistence marketplaces cause confusion and ineffective management rendering nutritional intervention as a sort of *institutional orphan* with poor accountability in implementation.

Whereas international agencies and local governments have enacted policies to combat under-nutrition and have been in place for decades, the success has been moderate at best at reducing malnutrition because there has been a large degree of heterogeneity in the implementation of, and adherence to, these policies across geographies, even within countries. The top-down approach does not always meet the diversity of needs experienced by people in different locations. This is where the bottom-up approach that characterizes the subsistence marketplaces stream holds potential.

Several opportunities in this *bottom-up* context including community-based and interpersonal counseling have been shown to improve the nutritional status in various settings in India. The use of locally produced, culturally relevant and fortified complementary foods or fortified complementary food supplements can lead to further improvements of childhood nutrition. For sustainable effect, care should be taken to ensure that the products created for these socio-

economic communities are affordable for both organizations as well as families. It is critical to consider all the economic and cultural forces at play, and develop programs based on accurate assumptions. Some of author's interactions with the markets suggest that the engagement of the associates in the nutrition interventional organization is often low due to lack of rewards, government funding or corruption in the system. This impacts the productivity and creativity that is needed to solve multi-dimensional issues in delivering the solutions.

Evidence from program interventions suggests several critical success factors: innovative behavioral change campaigns based on formative research, integrated approaches tackling multiple determinants of stunting, maternal education and empowerment of women, and good coverage requiring strengthening of the health system and organizations delivering the interventions.

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Nagendra Rangavajla has more than 25 years of professional experience in the food and nutrition industry, globally, and has contributed to improving quality of life of people through nutritional and food products for all ages and health conditions.

Nagendra earned his PhD from University of Mysore, India, followed by Post-doctoral research at the University of Nebraska, Lincoln, NE. He is a professional member of IFT and a Fellow of American College of Nutrition. He has authored several publications, patents and book chapters in the area of nutrition, clinical science, food science, food packaging and food processing. His work experience includes both large CPG companies as well as start-up companies.

He has collaborated with Subsistence Marketplace student immersion programs at University of Illinois Urbana Champaign and more recently at Loyola Marymount University. He brings passion in his engagement with Subsistence Marketplace initiatives with an emphasis on mentoring students and talent development.